CLAIMS

We claim:

22. A method for determining the optimal tuning parameters in a linear controller, wherein

    1) said controller receives an n-dimensional process variable signal y(k) from a process and an n-dimensional set-point signal r(k), calculates an m-dimensional controller output u(k) according to a linear control equation, and sends said u(k) to said process, where k is the integer discrete time variable and n and m are positive integers;

    2) said tuning parameters are the adjustable numbers in the coefficients in said linear control equation that are to be determined; and

    3) said method finds the optimal values for said tuning parameters by minimizing the maximum of absolute values of all poles of the discrete-time closed-loop transfer function from said set-point r(k) to said process variable y(k).

23. A method as in Claim 22, wherein said minimization of the maximum of absolute values of all poles of said discrete-time closed-loop transfer function is subject to user-specified constraints placed on one or more of said tuning parameters.

24. A method as in Claim 22, wherein said controller output u(k) = u(k-1) + K_1*r(k)*T + K_1*a(k,1) + K_2*a(k,2) + ... + K_p*a(k,p), wherein k is the discrete time variable, * is the multiplication operator, T is the sampling period, p is a positive integer, the m by n matrices K_1, K_2, ..., and K_p are tuning parameters, a(k,1) = [-y(k)]*T, and a(k, p) = [a(k,p-1) – a(k-1,p-1)] / T for p> or =2.

25. A method as in Claim 23, wherein said controller output u(k) = u(k-1) + K_1*r(k)*T + K_1*a(k,1) + K_2*a(k,2) + ... +K_p*a(k,p), wherein k is the discrete time variable, * is the multiplication operator, T is the sampling period, p is a positive integer, the m by n matrices K_1, K_2, ..., and K_p are tuning parameters, a(k,1) = [-y(k)]*T, and a(k, p) = [a(k,p-1) – a(k-1,p-1)] / T for p> or =2.

26. A method as in Claim 22, wherein said linear controller is a PID (proportional-integral- derivative) controller.

27. A method as in Claim 23, wherein said linear controller is a PID controller.

28. A linear controller as in Claim 22 with its tuning parameters determined therein.

29. A linear controller as in Claim 23 with its tuning parameters determined therein.

30. A linear controller as in Claim 24 with its tuning parameters determined therein.
31. A linear controller as in Claim 25 with its tuning parameters determined therein.
32. A PID controller as in Claim 26 with its tuning parameters determined therein.
33. A PID controller as in Claim 27 with its tuning parameters determined therein.